MULTIMEDIA UNIVERSITY®

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2018/2019

HBC1021 – BIOCHEMISTRY II

13 March 2019
9:00 AM – 11:00 AM
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This paper consists of **4 pages** (including the front page)
2. This paper consists of **5 Short Answer Type questions**. All questions carry equal marks (10 marks per question).
3. Answer **ALL QUESTIONS.**
4. Print your answers **clearly** and **neatly** in the Answer Booklet provided.

Question 1

A. What is the difference between anabolic and catabolic reactions? [2 marks]

B. Describe briefly TWO principles of metabolism. [2 marks]

C. Why is glycolysis rate becoming more rapid after the infusion of fructose? [1 mark]

D. Glycolysis and gluconeogenesis are parts of the glucose metabolism.
   a. Name THREE enzymes that regulate glycolytic pathway. [1.5 marks]

   b. Under the following condition, name the products from the conversion of pyruvate.
      i. Aerobic condition
      ii. Anaerobic condition (Yeast)
      iii. Anaerobic condition (Muscle) [1.5 marks]

E. How is the Krebs cycle pathway regulated? List TWO strategies. [1 mark]

F. What is the step that links between glycolysis and the citric acid cycle? What protein complex catalyzes this step? [1 mark]

Question 2

A. Describe briefly FOUR strategies used to inhibit oxidative phosphorylation. [2 marks]

B. Why was dinitrophenol once used as a diet drug? [1 mark]

C. Name TWO examples of reactive oxygen species. Why are they dangerous to cells? [2 marks]

D. NADPH is an inhibitor of the pentose phosphate pathway. What is the metabolic logic behind this regulatory process? [1 mark]

E. The deficiency of some enzymes involved in glucose metabolism can cause hemolytic anemia. List TWO examples of the glucose metabolism enzymes. [1 mark]

F. Suggest a reason why a different reducing agent (NADPH) is used in anabolic reactions rather than NADH, which plays a role in catabolic ones. [2 marks]

G. List TWO substrates for gluconeogenesis. [1 mark]

Continued...

Question 3

A. What is photorespiration? What would be the effect on plants if photorespiration did not exist? [2 marks]

B. Describe the biochemical differences of mitochondria and chloroplasts. [2 marks]

C. Give TWO reasons why triacylglycerols are extraordinarily efficient for energy storage. [2 marks]

D. What is the main energy source for the brain
   a. when the nutrient is abundant? [0.5 mark]
   b. when the nutrient is limited? [0.5 mark]

E. What is the function of carnitine-mediated shuttle system in fatty acid catabolism? [1 mark]

F. Name the rate-limiting step in cholesterol synthesis, its enzyme and its drug inhibitor. [2 marks]

Question 4

A. What are the sources of carbon and amino skeletons for amino acid biosynthesis? [2 marks]

B. When amino acids are catabolized, what are the end products of the carbon skeletons for glucogenic amino acids? For ketogenic amino acids? [2 marks]

C. What is autophagy? What is the main difference between autophagy and ubiquitin-proteasome system? [2 marks]

D. Gout is a disease caused by a defect in purine metabolism. Why do most mammals, other than primates, not suffer from gout? [2 marks]

E. Differentiate between the *de novo* synthesis of nucleotides and salvage-pathway synthesis. [2 marks]

Continued...

Question 5

A. Describe TWO metabolic engineering strategies that can be used to improve the production of natural products. [2 marks]

B. Explain why type 1 diabetics require insulin injections, whereas insulin injections are effective in only a portion of type 2 diabetics. [2 marks]

C. At only 2% of body mass, brain consumes at least 20% of the total energy demands of the body. What is the use of most of the energy in the brain? [2 marks]

D. Pancreatic β cells express a receptor for fatty acids. Fatty acid binding to the protein appears to stimulate insulin secretion. Does this phenomenon make metabolic sense? [1 mark]

E. Asian flush syndrome occurs an individual develops flushes or blotches on the body after consuming alcoholic beverages. What is the biochemical basis of this phenomenon? [1 mark]

F. All of the metabolic pathways are affected by the need for ATP. What is the effect of AMP-dependent protein kinase (AMPK) on catabolic and anabolic pathways? [2 marks]

End of paper